

Complete Summary

GUIDELINE TITLE

Diagnostic imaging practice guidelines for musculoskeletal complaints in adults - an evidence-based approach. Part 3: spinal disorders.

BIBLIOGRAPHIC SOURCE(S)

Bussieres AE, Taylor JA, Peterson C. Diagnostic imaging practice guidelines for musculoskeletal complaints in adults-an evidence-based approach-part 3: spinal disorders. J Manipulative Physiol Ther 2008 Jan;31(1):33-88. [422 references]
[PubMed](#)

GUIDELINE STATUS

This is the current release of the guideline.

The literature review and the guidelines should be updated every 3 years.

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
RECOMMENDATIONS
EVIDENCE SUPPORTING THE RECOMMENDATIONS
BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS
QUALIFYING STATEMENTS
IMPLEMENTATION OF THE GUIDELINE
INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT
CATEGORIES
IDENTIFYING INFORMATION AND AVAILABILITY
DISCLAIMER

SCOPE

DISEASE/CONDITION(S)

Musculoskeletal disorders of the spine

GUIDELINE CATEGORY

Diagnosis
Evaluation
Risk Assessment

CLINICAL SPECIALTY

Chiropractic
Emergency Medicine
Family Practice
Geriatrics
Orthopedic Surgery
Physical Medicine and Rehabilitation
Radiology
Sports Medicine

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Chiropractors
Health Care Providers
Health Plans
Hospitals
Nurses
Physical Therapists
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

- To develop evidence-based diagnostic imaging practice guidelines to assist chiropractors and other primary care providers in decision making for the appropriate use of diagnostic imaging for spinal disorders
- To assist current and future health care providers to make appropriate use of imaging studies, providing indications for the need of imaging studies according to current literature, and expert consensus, and assisting in optimizing the utilization of limited available resources. These proposed guidelines are intended to reduce unnecessary radiation exposure and the use of specialized imaging studies, increase examination precision and decrease health care costs—all without compromising quality of care.

TARGET POPULATION

Adult patients presenting with musculoskeletal disorders of the spine

Note: Children and pregnant patients are excluded from these guideline recommendations.

INTERVENTIONS AND PRACTICES CONSIDERED

Diagnostic Assessment

1. Computed tomography (CT)
2. Magnetic resonance arthrography (MRA)
3. Magnetic resonance imaging (MRI)
4. Nuclear medicine (bone scan) (NM)
5. Range of motion (ROM)
6. Ultrasound (US)

7. Plain film radiograph

MAJOR OUTCOMES CONSIDERED

- Accuracy of diagnostic tests
- Utility of radiologic examinations in differential diagnosis
- Absence of pain
- Speed of return to normal activity level
- Neurologic deficits
- Sciatica

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

A comprehensive search of the English and French language literature was conducted using a combination of subject headings and keywords.

Electronic searches in English and French language literature occurred and cross references were repeated on 3 different occasions between 2003 and 2006.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

Classification based on Stroke Prevention and Educational Awareness Diffusion (SPREAD) validated methodological criteria.

1++: High-quality meta-analyses without heterogeneity, systematic reviews of randomized controlled trials (RCTs) each with small confidence intervals CI), or RCTs with very small CI and/or very small alpha and beta

1+: Well-conducted meta-analyses without clinically relevant heterogeneity, systematic reviews of RCTs, or RCTs with small CI and/or small alpha and beta

1–: Meta-analyses with clinically relevant heterogeneity, systematic reviews of RCTs with large CI, or RCTs with large CI and/or alpha or beta

2++: High-quality systematic reviews of case-control or cohort studies. High-quality case-control or cohort studies with very small CI and/or very small alpha and beta

2+: Well-conducted case-control or cohort studies with small CI and/or small alpha and beta

2–: Case-control or cohort studies with large CI and/or large alpha or beta

3: Nonanalytic studies, (e.g., case reports, case series)

4: Expert opinion

– (minus): Meta-analyses with clinically relevant heterogeneity; systematic reviews of trials with large confidence intervals; trials with large CIs, and/or large alpha and/or beta

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Methods for Synthesizing Evidence

1. Literature search and independent literature assessment of spinal disorders: Quality of diagnostic accuracy studies (QUADAS), Appraisal of Guidelines Research and Evaluation (AGREE), and Stroke Prevention and Educational Awareness Diffusion (SPREAD).
2. Initial draft: Template based on European Commission classification (2001).
3. Expert consensus: A 2-round modified Delphi process was used to generate consensus among an international panel of more than 50 experts in musculoskeletal disorders.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

A Delphi panel composed of international experts on the topic of musculoskeletal disorders in chiropractic radiology, clinical sciences, and research were invited to review and propose recommendations on the indications for diagnostic imaging.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Grades of Recommendation

The Stroke Prevention and Educational Awareness Diffusion (SPREAD) tool has been developed to grade recommendations according to the strength of available scientific evidence (level A to D)

A: At least one meta-analysis, systematic review or RCT rated as 1++, and directly applicable to the target population; or a systematic review of RCTs or a body of evidence consisting principally of studies rated as 1+, directly applicable to the target population and demonstrating overall consistency of results

B: A body of evidence including studies rated as 2++, directly applicable to the target population and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 1++ or 1+

C: A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 2++**

D: Evidence level 3 or 4; or extrapolated evidence from studies rated as 2+; or evidences from trials classified as (minus) regardless of the level

Good practice point: Recommended best practice based on the clinical experience of the guideline development group, without research evidence.

This tool aims to evaluate the scientific evidence according to prespecified levels of certainty (1++ to 4). In this study, Good Practice Point also represents consensus of the Delphi panel. CI indicates confidence intervals.

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Clinical Validation-Pilot Testing
Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The guidelines were pilot tested and peer reviewed by practicing chiropractors, and by chiropractic and medical specialists.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The grades of recommendations (A-D and GPP) and levels of evidence (1++, 1+, 1-, 2++, 2+, 2-, 3, 4) are defined at the end of the "Major Recommendations" field.

Table 1. Thoracolumbar, Lumbar, and Thoracic Spine Trauma

Patient Presentation	Recommendations
<p>Adult patient with recent (<2 weeks [wk]) acute thoracolumbar, lumbar, or thoracic spine trauma</p> <p>Absence of pain, normal Range of Motion (ROM), and absence of neurologic deficits</p>	<p>Radiographs not routinely indicated [C]</p>
<p>Adult patient with thoracolumbar, lumbar or thoracic spine blunt trauma or acute injuries (falls, motor vehicle accidents (MVAs), motorcycle, pedestrian, cyclists, etc.)</p> <p>High-risk screening criteria for spinal injuries include any of the following:</p> <ol style="list-style-type: none"> 1. Back pain 2. Midline tenderness on palpation 3. Distracting painful injury and other high-risk mechanism of injury 4. Neurologic deficits 5. Altered consciousness (caused by head trauma, intoxication/ethanol, or drugs) 	<p>Radiographs indicated [B]</p> <p>Lumbar AND thoracic spine: anteroposterior (AP), lateral views</p> <p>Special investigations [C]</p> <ul style="list-style-type: none"> • Computed tomography (CT) scan (multidetector [multislice], spiral CT) • Magnetic resonance imaging (MRI)
<p>Adult patient with posttraumatic chest wall pain</p> <p>Minor trauma</p>	<p>Radiographs not routinely indicated [D]</p>
<p>Major trauma</p>	<p>Radiographs indicated [GPP]</p> <p>Posteroanterior (PA), lateral chest radiographs</p> <p>Specific rib radiographs (AP), oblique)</p> <p>Additional views: PA chest in full expiration, thoracic and /or lumbar spine views</p>

Patient Presentation	Recommendations
	Special investigations [GPP] <ul style="list-style-type: none"> CT for sternum injury, pulmonary, pleural, and osseous abnormalities
Adult patient with pelvis and sacrum trauma (including falls with inability to bear weight)	Radiographs indicated [D] AP pelvis and lateral hip "frog leg" Additional views: lateral lumbar view Angulated AP sacrum view (15-45° cephalad) Special investigations [D] <ul style="list-style-type: none"> Nuclear medicine (NM), MRI or CT may be helpful if radiographs are normal or equivocal.
Coccyx trauma and coccydynia Consider views of the sacrum if distal sacrum fracture is suspected	Radiographs not routinely indicated: (spot AP, lateral coccyx) [C] Additional views: AP, lateral sacrum, dynamic sitting lateral views of the coccyx

Table 2. Cervical Spine Trauma

Patient Presentation	Recommendations
Adult patient with acute neck injury and <i>negative</i> CCSR (Canadian Cervical Spine Rule for Radiography in Alert and Stable Trauma Patients)	Radiographs not routinely indicated [B]
Adult patient with acute neck injury and <i>positive</i> CCSR (Canadian Cervical Spine Rule for Radiography in Alert and Stable Trauma Patients) Conventional radiographs recommended in the presence of any of the Canadian	Radiographs indicated [B] APOM, AP lower cervical, neutral lateral If fracture is suspected: 3 views + CT scan recommended

Patient Presentation	Recommendations
<p>Cervical Spine Rule criteria are fulfilled:</p> <p>A. High-risk factors in alert and stable patient?</p> <ol style="list-style-type: none"> 1. Age >65 2. Dangerous mechanisms of injury 3. Paresthesias in extremities <p>B. Low-risk factors that allow ROM assessment?</p> <ol style="list-style-type: none"> 1. Simple rear end collision 2. Patient seated in the waiting room 3. Ambulatory at one time since trauma 4. Delayed cervical pain onset 5. Absence of midline cervical tenderness <p>C. ROM Assessment: Is patient able to actively turn his/her head to 45 degrees in both directions?</p>	<p>Additional views: CT now replaces oblique, pillar, dynamic flexion/extension (F/E) in suspected fracture [GPP]</p> <p>Special investigations [C]</p> <ul style="list-style-type: none"> • CT, MRI

Table 3. Adult Nontraumatic Lumbar Spine Disorders

Patient Presentation	Recommendations
<p>Adult patient with acute uncomplicated* LBP (<4 wks' duration)</p> <p>*Uncomplicated definition: nontraumatic LBP without neurologic deficits or indicators of potentially serious pathologies)—(see red flag list for details in the original guideline document).</p> <p>For most young or middle-aged adults, early diagnostic evaluation of low back complaints may focus on 3 basic questions (diagnostic imaging is infrequently required) (Jarvik, 2002).</p> <ol style="list-style-type: none"> 1. Is there underlying systemic 	<p>Radiographs not initially indicated [B]</p> <p>Special investigations not indicated [B]</p>

Patient Presentation	Recommendations
<p>disease?</p> <ol style="list-style-type: none"> Is there neurologic impairment that might require surgical intervention? Is social or psychological distress amplifying or prolonging the pain? 	
<p>Adult patient with uncomplicated subacute (4-12 wks' duration) or persistent low back pain (LBP) (>12 wks' duration) AND no previous treatment trial.</p> <p>A trial of up to 4-6 wk of conservative care is appropriate before radiographs</p>	<p>Radiographs not initially indicated [B]</p>
<p>Adult patient with nontraumatic acute LBP AND sciatica (no red flags)</p> <p>The first clinical clue to neurologic impairment usually is a history of sciatica: sharp pain radiating down the posterior or lateral aspect of the leg, often associated with numbness or paresthesia.</p>	<p>Radiographs not initially indicated [B]</p>
Specific Clinical Diagnoses	
<p>Common causes of sciatica</p> <p>A. Suspected LDH:</p> <ul style="list-style-type: none"> Risk factors for lumbar disc herniation (LDH) include: men (1.6 times more likely), middle age (35-54 years [y]), repetitive/heavy lifting, current smoking, obesity (high body mass index (BMI), and type of occupation. Predominantly leg pain, typically involving the foot 	<p>Radiographs not initially indicated [B] unless patient age >50 or has progressive neurologic deficits</p>
<p>B. Suspected degenerative spondylolithesis/lateral stenosis</p>	<p>Radiographs indicated if patient age >50 or has progressive neurologic deficits: PA (or AP), lateral lumbar views</p>

Patient Presentation	Recommendations
<ul style="list-style-type: none"> • Back pain with or without leg pain • Increased pain with activity • Signs and symptoms (S&S) with or without neurologic deficit 	<p>[GPP]</p>
<p>C. Suspected lumbar degenerative spinal stenosis</p> <ul style="list-style-type: none"> • More common (MC) >65 years of age (YOA) (sensitivity of 0.7; specificity of 0.69) • Neurogenic claudication • Variable neurologic deficit (numbness, weakness, etc) 	<p>Radiographs indicated if patient age >50 or has progressive neurologic deficits: PA (or AP), lateral lumbar views [C]</p>
<p>Suspected causes of sciatica:</p> <p>A. Lumbar disc herniation</p> <p>B. Degenerative spondylolithesis/lateral stenosis</p> <p>C. Lumbar degenerative spinal stenosis</p>	<p>Special investigations not initially indicated [C]</p> <p>Co-management or specialist referral recommended even if conventional radiographs are unremarkable:</p> <ol style="list-style-type: none"> 1. After failed conservative therapy (4-6 wk) 2. For preoperative planning 3. If patient's neurologic status is deteriorating (progressive deficit, disabling leg pain) <ul style="list-style-type: none"> • MRI, CT
<p>Adult patient reevaluation in the absence of expected treatment response or worsening after 4-6 wk</p> <p>Should patient fail to improve as expected or marginally improve within 4-6 wk of initial evaluation, the clinician must review history and physical findings and request appropriate diagnostic imaging studies.</p>	<p>Radiographs indicated [B]</p> <p>PA (or AP), lateral lumbar views</p> <p>Additional views not routinely indicated [C]</p> <p>Spot lateral, oblique. lateral flexion films may be indicated in scoliosis evaluation</p> <p>Comanagement or specialist referral recommended even if conventional radiographs are unremarkable</p> <ol style="list-style-type: none"> 1. And if conventional radiography

Patient Presentation	Recommendations
	<p>reveals suspected pathology.</p> <ol style="list-style-type: none"> 2. After failed conservative therapy (4-6 wk) 3. If patient neurologic status is deteriorating (progressive deficit, disabling leg pain) 4. If clinical signs suggest instability. Presumed instability is loosely defined as $>10^{\circ}$ of angulation or 4 mm of vertebral displacement on flexion and extension lateral radiographs. However, diagnostic criteria, natural history, and surgical indications remain controversial 5. For preoperative planning <p>Special investigations [C]</p> <ul style="list-style-type: none"> • MRI or CT scan
<p>Adults with complicated (i.e., "red flag") LBP and indicators of contraindication to spinal manipulative therapy (SMT) (relative/absolute):</p> <p>Presence of the following indicator(s) should alert the clinician to possible underlying pathology. Presence of a red flag alone may not necessarily indicate the need for radiology.</p> <ul style="list-style-type: none"> • <i>Patient <age 20 and >age 50, particularly with S&S suggesting systemic disease</i> • <i>No response to care after 4 wk</i> • <i>Significant activity restriction >4 wk</i> • <i>Nonmechanical pain (unrelenting pain at rest, constant or progressive S&S)</i> • <i>Suspected inflammatory—spondyloarthritides</i> • <i>Suspected compression fracture</i> • <i>Suspected neoplasia</i> • <i>Suspected infection</i> 	<p>**Risks of having a serious pathology may be higher before the age of 20 or over the age of 55. Particular attention to indicators of possible underlying pathology should be given for patients in these age categories.</p> <p>Radiographs indicated [B] PA (or AP), lateral lumbar views.</p> <p>Additional views: Hibb's</p> <p>(Spot angled PA or AP lumbosacral), oblique SI views</p> <p>Advanced imaging and specialist referral recommended:</p> <ol style="list-style-type: none"> 1. In the presence of a potentially serious pathology as suggested by the patient history, examination, and/or radiograph 2. In the absence of clinical improvement after 4-6 wk of therapy 3. If function does not improve or deteriorates 4. If patient neurologic status is deteriorating (progressive deficit,

Patient Presentation	Recommendations
<ul style="list-style-type: none"> • <i>Suspected failed surgical fusion</i> • <i>Progressive or painful structural deformity</i> • <i>Elevated laboratory examination and positive S&S</i> 	<p>disabling leg pain)</p> <ol style="list-style-type: none"> 5. With painful or progressive structural deformity 6. For unstable segment (spondylolisthesis or pathological process) 7. When patient has persisting S&S 8. In complication from treatment (possible fracture, new/progressive neurologic deficit, considerable pain, or disability, etc) <p>Special investigations [B] Even if conventional radiographs are negative</p> <ul style="list-style-type: none"> • MRI, CT, NM
<ul style="list-style-type: none"> • <i>Suspected Cauda equina syndrome (CES)</i> <p>The classic syndrome includes LBP, bilateral or unilateral sciatica, saddle anesthesia, motor weakness of the lower extremities that may progress to paraplegia, urinary retention, or bowel and bladder incontinence.</p>	<p>Emergency referral without imaging [B]</p> <p>Special investigations [C] (see above for details)</p>
<ul style="list-style-type: none"> • <i>Suspected abdominal aortic aneurysms (AAA)</i> <p>Early S&S may include abdominal pain, backache, and feeling of fullness or abdominal pulsation.</p>	<p>Referral for specialized investigations [B]</p> <ul style="list-style-type: none"> • Management (ultrasound screening/monitoring and surgical consultation) according to patient history and size of AAA
<ul style="list-style-type: none"> • <i>Truncal symptoms attributed to the presence or worsening of aortic aneurysms including dissection/rupture/occlusion or traumatic aortic injury</i> <p>Cardiovascular shock and/or syncope, severe tearing/ripping midabdominal sensation, back, groin or testicular pain; pressure upon lumbar spine causing excruciating boring pain in the abdomen or back; hypotension; absence distal</p>	<p>Emergency referral without imaging [GPP]</p> <ul style="list-style-type: none"> • It is vital to recognize the S&S of dissecting AAA as this is a surgical emergency

Patient Presentation	Recommendations
lower limb pulses	

Table 4. Nontraumatic Thoracic Spine Disorders

Patient Presentation	Recommendations
<p>Adult patient with uncomplicated* acute thoracic spine pain (<4 wks' duration)</p> <p>AND</p> <p>Adult patient with uncomplicated* subacute (4-12 wks' duration) or persistent (>12 wks' duration) thoracic spine pain and no previous treatment trial.</p> <p>*Uncomplicated definition: Nontraumatic thoracic pain without neurologic deficits or indicators of potentially serious pathologies</p>	<p>Radiographs not routinely indicated [B]</p> <p>Special investigations not indicated [B]</p>
<p>Adult patient: reevaluation in the absence of expected treatment response or worsening after 4 wk.</p> <p>Should patient fail to improve as expected or marginally improve within 4 wk of initial evaluation, the clinician must review history and physical findings and request appropriate diagnostic imaging studies.</p>	<p>Radiographs indicated [B]</p> <p>AP, lateral thoracic spine views</p> <p>Additional views: Swimmer's view</p> <p>Co-management or specialist referral recommended</p> <ol style="list-style-type: none"> 1. In suspected pathology as seen on conventional radiography 2. After failed conservative therapy (4 wk) 3. If patient neurologic status is deteriorating (progressive deficit, disabling leg pain) <p>Special investigations [C]</p> <ul style="list-style-type: none"> • MRI or CT scan
<p>Adult patient with nontraumatic chest wall pain</p>	<p>Emergency referral without imaging in life-threatening conditions [GPP]</p>

Patient Presentation	Recommendations
History and physical exam first need to rule out life-threatening conditions including pathologies of the heart, lungs and large vessels.	Special investigations [C] <ul style="list-style-type: none"> CT and MRI
Musculoskeletal causes of chest wall pain (diagnosis of exclusion)	Radiographs not routinely indicated [D]
<p>Adult patient with complicated (i.e., "red flag") thoracic pain and indicators of contraindication to SMT (relative/absolute)</p> <p>Presence of the following indicator(s) should alert the clinician to possible underlying pathology.</p> <p>Note well (NB). Presence of a red flag alone may not necessarily indicate the need for radiography.</p> <p>Patient <age 20 and >age 50, particularly with S&S suggesting systemic disease**</p> <ul style="list-style-type: none"> No response to care after 4 wk Significant activity restriction >4 wk Nonmechanical pain (unrelenting pain at rest, constant or progressive S&S) Persistent localized pain (>4 wk) Progressive or painful structural deformity: scoliosis, kyphoscoliosis (Otani, Konno, & Kikuchi, 2001) Symptoms associated with neurologic signs in the lower extremities Suspected inflammatory spondyloarthropathy Suspected neoplasia Suspected infection Suspect failed surgical fusion Elevated laboratory examination and positive S&S In recent significant trauma (any age) 	<p>**Risks of having a serious pathology may be higher before the age of 20 or over the age of 55. Particular attention to indicators of possible underlying pathology should be given for patients in these age categories.</p> <p>Radiographs indicated [B]</p> <p>AP, lateral thoracic spine views.</p> <p>Additional views: Spot view. In suspected inflammatory spondyloarthropathy, consider: Hibb's (spot angled AP lumbosacral), oblique SI views</p> <p>Advanced imaging and specialist referral recommended even if conventional radiographs are unremarkable:</p> <ol style="list-style-type: none"> In presence of a potentially serious pathology as suggested by the patient history, examination and/or radiograph In the absence of clinical improvement after 4 to 6 wk of therapy If function does not improve or deteriorates If patient neurologic status is deteriorating (progressive deficit, disabling leg pain) With painful or progressive structural deformity For unstable segment (spondylolisthesis or pathological process) When patient has persisting S&S In complication from treatment (possible fracture, new/progressive neurologic deficit, considerable pain or

Patient Presentation	Recommendations
	<p>disability, etc.)</p> <p>Special investigations [B]</p> <ul style="list-style-type: none"> • MRI, CT, NM
<ul style="list-style-type: none"> • <i>Suspected acute thoracic aortic aneurysms dissection/rupture/occlusion or traumatic aortic injury</i> <p>Severe, tearing/ripping chest sensation, back pain; hypotension; absent distal pulse. High index of suspicion in connective tissue disorders and diseases with genetic predisposition for ascending aortic aneurysms.</p>	<p>Emergency referral without imaging [GPP]</p>
<ul style="list-style-type: none"> • <i>Suspected compression fracture</i> <p>Severe onset of pain (with or without appearance of spinal deformity) after minor trauma in older patients. Patients with thoracic or lumbar spine osteoporotic fractures report pain mainly in the lumbosacro-gluteal area. Look for history (Hx) of repetitive stress of sufficient severity or Hx of high risk osteoporosis</p> <p>Risk factors for additional vertebral fractures:</p> <p>Histories of a previous fracture, greater age, lower femoral neck bone mass density, shorter height</p>	<p>Radiographs indicated [B]: AP, lateral thoracic spine views</p> <p>Additional views [D]: Supine cross-table lateral view in suspected osteoporotic vertebral pseudoarthrosis</p> <p>Special investigations [D]</p> <ul style="list-style-type: none"> • MRI/CT if initial radiographs are positive, difficult to interpret, in presence of complex lesions, for suspected ligamentous instability or neural injuries.
<p><i>Suspected osteoporosis</i></p> <p>See osteoporosis clinical decision rules in the original guideline document.</p>	<p>Radiographs are <i>unreliable</i> for assessment of bone mass changes before at least a 30%-50% loss</p> <p>Special investigations [B]</p> <p>If clinical decision rules are positive</p> <ul style="list-style-type: none"> • Bone densitometry or dual-energy

Patient Presentation	Recommendations
	x-ray absorptiometry (DXA)
Adult patient with nonpainful and nonprogressive scoliosis	Radiographs not routinely indicated [C]
Adult patient with painful or progressive scoliosis	<p>Radiographs indicated [B]</p> <p>Erect sectional radiographs (better detail) or standing full-length PA (14 × 36 in) and lateral sectionals</p> <p><i>Additional views:</i></p> <ol style="list-style-type: none"> 1. Right and left lateral bending <p>Follow-up evaluation dictated by clinical progression [C]</p> <p>Repeat radiographs, specialist referral and advanced imaging recommended [B]:</p> <ol style="list-style-type: none"> 1. In the absence of clinical improvement; after 4 to 6 wk of therapy 2. If function does not improve or deteriorates 3. In presence of persisting S&S or considerable pain 4. If patient neurologic status is deteriorating (progressive deficit, disabling leg pain) 5. With painful or progressive structural deformity (scoliosis, kyphoscoliosis) 6. With suspected segmental instability (this is common in adult scoliosis and should be considered with all manual therapy intervention) 7. With suspected pathological process 8. With new or progressive neurologic deficit including claudication, significant radiculopathy or suspected syrinx 9. To plan surgical intervention

Patient Presentation	Recommendations
	Special investigations [C] <ul style="list-style-type: none"> Spiral CT, MRI, sequential discograms, facet blocks, epidural blocks, CT-myelogram

Table 5. Nontraumatic Cervical Spine Disorders

Patient Presentation	Recommendations
Adult patient with acute uncomplicated* neck pain (<4 wks' duration) * <i>Uncomplicated definition:</i> Nontraumatic neck pain without neurologic deficits or indicators of potentially serious pathologies—(see red flag list in original guideline document for details).	Radiographs not initially indicated [C] Special investigations not indicated [C]
Adult patient with nontraumatic neck pain and radicular symptoms A. Suspected acute cervical disc herniation (CDH) B. Suspected acute cervical spondylotic radicular syndrome/lateral canal stenosis	Radiographs indicated [D/consensus] Anteroposterior open mouth (APOM), AP lower cervical, neutral lateral <i>Additional views:</i> Oblique views, swimmer's view Comanagement or specialist referral recommended even if conventional radiographs are unremarkable <ol style="list-style-type: none"> After failed conservative therapy (4 wk) For preoperative planning If patient neurologic status is deteriorating (progressive deficit, disabling arm pain) Special investigations [B] MRI

Patient Presentation	Recommendations
<p>Adult patient with uncomplicated* subacute (4-12 weeks duration) and persistent neck pain (>12 weeks) with <u>or</u> without arm pain.</p> <p>* <i>Uncomplicated definition</i>: See above definition</p>	<p>Radiographs not initially indicated [consensus]</p> <p>APOM, AP lower cervical, neutral lateral</p> <p>N.B. This recommendation was modified according to the recent findings of The Bone and Joint Decade 2000-2010 Task Force on Neck Pain and its Associated Disorders (see articles published in Spine 2008; 33(4S)). (Boyle et al., 2008; Cassidy et al., 2008) A majority of Delphi panelists agreed with this change (92% of 50 respondents).</p>
<p>Adult patient reevaluation in the absence of expected treatment response or worsening after 4 weeks</p>	<p>Radiographs indicated [C]</p> <p>APOM, AP lower cervical, neutral lateral</p> <p><i>Additional views</i>: Oblique views, Swimmer's view, Flexion/Extension</p> <p>Comanagement or specialist referral recommended (even if conventional radiographs are unremarkable)</p> <ol style="list-style-type: none"> 1. If conventional radiography reveals suspected pathology 2. After failed conservative therapy (4 wk) 3. If patient neurologic status is deteriorating (progressive deficit, disabling arm pain) 4. If clinical signs suggest subaxial cervical spine instability (Moore, Vaccaro, & Anderson, 2006) 5. For preoperative planning <p>Special investigations [B]</p> <ul style="list-style-type: none"> • MRI
<p>Adult patient with complicated (i.e., "red flag") neck pain and indicators of contraindication to SMT</p> <p>Presence of the following indicator(s) should alert the clinician to possible</p>	<p>Radiographs indicated [B]</p> <p>APOM, AP lower cervical, neutral lateral</p> <p><i>Additional views</i>: Flexion/extension, oblique views, pillar view</p>

Patient Presentation	Recommendations
<p>underlying pathology.</p> <p>N.B. Presence of a red flag alone may not necessarily indicate the need for radiography.</p> <ul style="list-style-type: none"> • <i>Patient <age 20 and >age 50, particularly with S&S suggesting systemic disease</i> • <i>No response to care after 4 wk</i> • <i>Significant activity restriction >4 wk</i> • <i>Nonmechanical pain (unrelenting pain at rest, constant or progressive S&S)</i> • <i>Neck rigidity in the sagittal plain in the absence of trauma (discitis, infection, tumor, meningitis, etc)</i> • <i>Dysphasia</i> • <i>Impaired consciousness</i> • <i>Central nervous system S&S (cranial nerves, pathological reflexes, long tract signs)</i> • <i>High risk ligament laxity populations/suspected atlantoaxial instability (see original guideline document for details)</i> • <i>Arm or leg pain with neck movements, suspected cervical myelopathy and radiculo-myelopathy (see original guideline document for details)</i> • <i>Sudden onset of acute and unusual neck pain and/or headache (typically occipital) with or without neurologic symptoms, suspected cervical artery dissection (vertebral artery dissection (VAD), cervical artery dissection (CAD), Transient ischemic attack (TIA) (Vertebrobasilar insufficiency (VBI), carotid artery ischemia), stroke (see details below)</i> • <i>Hx of severe trauma (see</i> 	<p>Advanced imaging and specialist referral recommended:</p> <p>Special investigations [B]</p> <ul style="list-style-type: none"> • MRI

Patient Presentation	Recommendations
<i>Trauma section)</i>	
<p>In addition, also consider general red flags (usually applied to LBP) which may apply to the cervical spine</p> <ul style="list-style-type: none"> • <i>Suspected neoplasia</i> • <i>Suspected infection (discitis, osteomyelitis, tuberculosis)</i> • <i>Suspect failed surgical fusion</i> • <i>Progressive or painful structural deformity</i> • <i>Elevated laboratory examination and positive S&S</i> 	
<ul style="list-style-type: none"> • Suspected atlantoaxial instability (AAI) <p>High risk ligament laxity populations/possible atlantoaxial instability include</p> <ol style="list-style-type: none"> Active inflammatory arthritides Congenital disorders and hereditary connective tissues disorders 	<p>Radiographs indicated [B]</p> <p>APOM, AP lower cervical, neutral lateral</p> <p><i>Additional views [D]:</i> Flexion/extension laterals</p> <p>Monitoring, advanced imaging and specialist referral recommended:</p> <ol style="list-style-type: none"> ADI >3 mm, vertical dislocation, lateral, posterior or subaxial subluxations Upward odontoid translocation (pseudobasilar invagination) In presence of neurologic S&S <p>Special investigations [C]</p> <ul style="list-style-type: none"> • CT, MRI
<ul style="list-style-type: none"> • Suspected cervical compressive myelopathy (CCM) and radiculo-myelopathy 	<p>Radiographs indicated [C]</p> <p>APOM, AP lower cervical, neutral lateral and bilateral oblique views</p> <p><i>Additional views:</i> Swimmer's view</p> <p>Refer patient for investigation and possible surgical intervention:</p>

Patient Presentation	Recommendations
	<ol style="list-style-type: none"> 1. After failed conservative therapy (4 wk) 2. If patient's neurologic status is deteriorating (progressive deficit, disabling arm pain) 3. For preoperative planning <p>Special investigations [C]</p> <ul style="list-style-type: none"> • MRI (CT-myelography if not available). Electrophysiologic testing such as somatosensory evoked potentials (SSEP) may be useful.
<ul style="list-style-type: none"> • Suspected cervical artery dissection (Vertebral artery dissection [VAD], Cervical artery dissection [CAD]), Transient ischemic attack (TIA) (Vertebrobasilar insufficiency [VBI], carotid artery ischemia), stroke <p>The most important points in the history and chief complaint, which would warn of a possible cervical artery disease, are:</p> <ol style="list-style-type: none"> a. S&S of VBI—the "5D's And 3 N's": Dizziness, dysphasia, dysarthria (hoarseness), drop attacks, diplopia (or other visual problems), ataxia of gait (hemiparesis), nausea (possibly with vomiting), numbness (hemianesthesia), nystagmus b. S&S of carotid artery ischemia/stenosis: Confusion, dysphasia, headache, anterior neck and/or facial pain, hemianesthesia, hemiparesis or monoparesis, visual field disturbances c. Neck or occipital pain with sharp quality and severe intensity or severe and persistent headache that is sudden and unlike any 	<p>Emergency referral without imaging [GPP]</p> <p>Urgent referral should be made for appropriate investigation and treatment in patient presenting S&S of cerebrovascular ischemia or when S&S of head/neck pain is suspicious for an acute cervical artery disease.</p> <p>Special investigations [C]</p> <ul style="list-style-type: none"> • Initial investigation often includes CT scan to R/O hemorrhagic stroke. <p>Appropriate consultation and/or diagnostic procedures to evaluate the status of the cerebral circulation required in patients presenting with significant risk factors for cervical artery dissection. In such cases, approach the treatment with caution until a specific determination is made.</p>

Patient Presentation	Recommendations
<p>previous experienced pain or headache (even when it is suspected the pain is of a musculoskeletal or neuralgic origin)</p> <p>Should cervical artery problems be suspected, a thorough workup is indicated.</p>	

Definitions:

Levels of Evidence

Classification based on Stroke Prevention and Educational Awareness Diffusion (SPREAD) validated methodological criteria.

1++: High-quality meta-analyses without heterogeneity, systematic reviews of randomized controlled trials (RCTs) each with small confidence intervals CI), or RCTs with very small CI and/or very small alpha and beta

1+: Well-conducted meta-analyses without clinically relevant heterogeneity, systematic reviews of RCTs, or RCTs with small CI and/or small alpha and beta

1–: Meta-analyses with clinically relevant heterogeneity, systematic reviews of RCTs with large CI, or RCTs with large CI and/or alpha or beta

2++: High-quality systematic reviews of case-control or cohort studies. High-quality case-control or cohort studies with very small CI and/or very small alpha and beta

2+: Well-conducted case-control or cohort studies with small CI and/or small alpha and beta

2–: Case-control or cohort studies with large CI and/or large alpha or beta

3: Nonanalytic studies, (e.g., case reports, case series)

4: Expert opinion

– (minus): Meta-analyses with clinically relevant heterogeneity; systematic reviews of trials with large confidence intervals; trials with large CIs, and/or large alpha and/or beta

Grades of Recommendation

This tool has been developed to grade recommendations according to the strength of available scientific evidence (level A to D)

A: At least one meta-analysis, systematic review or RCT rated as 1++, and directly applicable to the target population; or a systematic review of RCTs or a body of evidence consisting principally of studies rated as 1+, directly applicable to the target population and demonstrating overall consistency of results

B: A body of evidence including studies rated as 2++, directly applicable to the target population and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 1++ or 1+

C: A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 2+**

D: Evidence level 3 or 4; or extrapolated evidence from studies rated as 2+; or evidences from trials classified as (minus) regardless of the level

Good practice point: Recommended best practice based on the clinical experience of the guideline development group, without research evidence.

This tool aims to evaluate the scientific evidence according to prespecified levels of certainty (1++ to 4). In this study, Good Practice Point also represents consensus of the Delphi panel. CI indicates confidence intervals.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

[References open in a new window](#)

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Selection of appropriate radiologic imaging procedures for evaluation of patients with musculoskeletal disorders of the spine; decrease unnecessary ionizing radiation exposure, decrease costs, and improve accessibility

POTENTIAL HARMS

Although somewhat controversial, it is important to remember that health hazards of all forms of radiation are cumulative. The Biological Effects of Ionizing Radiation (BEIR VII) 2005 report released by the National Academy of Sciences adds further support to the "linear-no-threshold" model of cancer risk from ionizing radiation exposure. In summary, this report concludes that ionizing radiation is dangerous even at low doses and that there are no safe limits. Given the potential risks associated with conventional radiography, only appropriate clinical indications can justify its use.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- These evidence-based diagnostic imaging practice guidelines are intended to assist primary care providers and students in decision making regarding the appropriate use of diagnostic imaging for specific clinical presentations. The guidelines are intended to be used in conjunction with sound clinical judgment and experience. For example, other special circumstances for radiographic imaging studies may include: patient unable to give a reliable history; crippling cancer phobia focused on back pain; need for immediate decision about career or athletic future or legal evaluation; history of significant radiographic abnormalities elsewhere reported to patient but no films or reliable report reasonably available; history of finding from other study (e.g., NM or gastrointestinal imaging) that requires spine radiographs for correlation. Application of these guidelines should help avoid unnecessary radiographs, increase examination precision, and decrease health care costs without compromising the quality of care.
- The descriptions of clinical presentations and proposed clinical diagnostic criteria, recommendations for imaging studies, and the comments provided throughout this document are a synthesis of the vast body of literature consulted before and during the various phases of this research project. Where the literature was found to be of poor quality or absent, consensus based on expert opinion was used. Although the investigators and collaborators carefully searched for all relevant articles, it is probable that some have been missed. Furthermore, as many new important studies are published in the near future, these will be incorporated in subsequent revisions of the guidelines and recommendations may change accordingly.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

Publication; applying to National Guideline Clearinghouse; posting of the electronic document on various websites (malpractice insurance carriers, outpatient teaching clinics); educational intervention strategies (e-learning, community pilot studies); referral guidelines; reinforced by request checking and clinical management algorithms; promotion by national, provincial and state organizations, conferences.

IMPLEMENTATION TOOLS

Foreign Language Translations
Slide Presentation

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Living with Illness

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Bussieres AE, Taylor JA, Peterson C. Diagnostic imaging practice guidelines for musculoskeletal complaints in adults-an evidence-based approach-part 3: spinal disorders. J Manipulative Physiol Ther 2008 Jan;31(1):33-88. [422 references]
[PubMed](#)

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2008 Jan

GUIDELINE DEVELOPER(S)

Canadian Protective Chiropractic Association - Professional Association
l'Université du Québec à Trois-Rivières - Academic Institution

SOURCE(S) OF FUNDING

l'Université du Québec à Trois-Rivières
Canadian Protective Chiropractic Association

GUIDELINE COMMITTEE

Not stated

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Authors: André E. Bussi res, DC, MSc, PhD student, University of Ottawa, Professor, Chiropractic Department, Universit  du Qu bec   Trois-Rivi res; John A.M. Taylor, DC, Professor of Radiology, New York Chiropractic College; Adjunct Professor, D'Youville College, Buffalo, New York; Cynthia Peterson, DC, RN, MMedEd, Professor, Swiss Academy for Chiropractic, Switzerland

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

The research team involved in the development of these guidelines declares no existing or potential conflict of interest. No investigators have received nor will receive any personal financial benefits or derive any salary from this project.

GUIDELINE STATUS

This is the current release of the guideline.

The literature review and the guidelines should be updated every 3 years.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the [Journal of Manipulative and Physiological Therapeutics](#). A French translation of the guideline is available from the [Universit  du Qu bec   Trois-Rivi res Web site](#).

Print copies: Available from Bussi res, Andr , department chiropratique, Universit  du Qu bec   Trois-Rivi res, C.P. 500, Trois-Rivi res, Qu bec, Canada G9A 5H7; E-mail: andre.bussieres@uqtr.ca.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Diagnostic imaging practice guidelines for musculoskeletal complaints in adults - an evidence-based approach: introduction. J Manipulative Physiol Ther 2007 Nov-Dec;30(9):617-683. Electronic copies: Available in Portable Document Format (PDF) from the [Journal of Manipulative and Physiological Therapeutics](#).
- Diagnostic imaging practice guidelines for musculoskeletal complaints in adults - an evidence-based approach. Part 3: spinal disorders. Slide presentation. 40 p. Electronic copies: Available from the [Universit  du Qu bec   Trois-Rivi res Web site](#).

Print copies: Available from Bussi res, Andr , department chiropratique, Universit  du Qu bec   Trois-Rivi res, C.P. 500, Trois-Rivi res, Qu bec, Canada G9A 5H7; E-mail: andre.bussieres@uqtr.ca.

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI Institute on February 23, 2009. The information was verified by the guideline developer on March 24, 2009.

COPYRIGHT STATEMENT

This NGC summary is based on the original guideline, which is subject to the guideline developer's copyright restrictions.

DISCLAIMER

NGC DISCLAIMER

The National Guideline Clearinghouse™ (NGC) does not develop, produce, approve, or endorse the guidelines represented on this site.

All guidelines summarized by NGC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public or private organizations, other government agencies, health care organizations or plans, and similar entities.

Guidelines represented on the NGC Web site are submitted by guideline developers, and are screened solely to determine that they meet the NGC Inclusion Criteria which may be found at <http://www.guideline.gov/about/inclusion.aspx>.

NGC, AHRQ, and its contractor ECRI Institute make no warranties concerning the content or clinical efficacy or effectiveness of the clinical practice guidelines and related materials represented on this site. Moreover, the views and opinions of developers or authors of guidelines represented on this site do not necessarily state or reflect those of NGC, AHRQ, or its contractor ECRI Institute, and inclusion or hosting of guidelines in NGC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding guideline content are directed to contact the guideline developer.

[Copyright/Permission Requests](#)

Date Modified: 4/20/2009

